



DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

[Docket No. FWS–R4–ES–2013–0103]

[4500030113]

RIN 1018–AZ10

Endangered and Threatened Wildlife and Plants; Endangered Species Status for *Agave eggersiana* and *Gonocalyx concolor*, and Threatened Species Status for *Varronia rupicola*

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Final rule.

SUMMARY: We, the U.S. Fish and Wildlife Service (Service), determine endangered species status under the Endangered Species Act of 1973, as amended (Act), for *Agave*

eggersiana (no common name) and *Gonocalyx concolor* (no common name), and threatened species status for *Varronia rupicola* (no common name). These three plants are endemic to the Caribbean. The effect of this regulation will be to add these species to the List of Endangered and Threatened Plants.

DATES: This rule is effective [**INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER**].

ADDRESSES: This final rule is available on the Internet at <http://www.regulations.gov> and <http://www.fws.gov/caribbean/es>. Comments and materials we received, as well as supporting documentation we used in preparing this rule, are available for public inspection at <http://www.regulations.gov>. All of the comments, materials, and documentation that we considered in this rulemaking are available by appointment, during normal business hours at: U.S. Fish and Wildlife Service, Caribbean Ecological Services Field Office, P.O. Box 491, Road 301 Km. 5.1, Boquerón, PR 00622; telephone 787-851-7297.

FOR FURTHER INFORMATION CONTACT: Marelisa Rivera, Deputy Field Supervisor, U.S. Fish and Wildlife Service, Caribbean Ecological Services Field Office, P.O. Box 491, Road 301 Km. 5.1, Boquerón, PR 00622; telephone 787-851-7297; or facsimile 787-851-7440. Persons who use a telecommunications device for the deaf

(TDD) may call the Federal Information Relay Service (FIRS) at 800–877–8339.

SUPPLEMENTARY INFORMATION:

Executive Summary

Why we need to publish a rule. Under the Act, a species may warrant protection through listing if it is endangered or threatened throughout all or a significant portion of its range. Listing a species as an endangered or threatened species can only be completed by issuing a rule.

This rule lists *Agave eggersiana* (no common name) and *Gonocalyx concolor* (no common name) as endangered species, and *Varronia rupicola* (no common name) as a threatened species under the Act. Elsewhere in today’s **Federal Register**, we designate critical habitat for *Agave eggersiana*, *Gonocalyx concolor*, and *Varronia rupicola* under the Act.

The basis for our action. Under the Act, we may determine that a species is an endangered or threatened species based on any of five factors: (A) The present or threatened destruction, modification, or curtailment of its habitat or range; (B) overutilization for commercial, recreational, scientific, or educational purposes; (C) disease or predation; (D) the inadequacy of existing regulatory mechanisms; or (E) other natural or manmade factors affecting its continued existence. We have determined that listing is warranted for these species, which are currently at risk throughout all of their

respective ranges due to threats related to:

- *Agave eggersiana*—potential future development for residential, urban, and tourist use; agriculture use; dropping of debris; competing nonnative plants; fires; hurricanes; predation; and disease cause by insects (weevils).
- *Goncalyx concolor*—installation or expansion of telecommunication towers, road improvement, vegetation management, and small number of individuals and populations.
- *Varronia rupicola*—loss of habitat due to urban development, right-of-way development and maintenance, deforestation, and hurricanes; and inadequate existing regulatory mechanisms (lack of enforcement).

Peer review and public comment. We sought comments from independent specialists to ensure that our determination is based on scientifically sound data, assumptions, and analyses. We invited these peer reviewers to comment on our listing proposal. We also considered all other comments and information we received during the comment period.

Previous Federal Action

Please refer to the proposed listing rule for *Agave eggersiana*, *Goncalyx concolor*, and *Varronia rupicola* (78 FR 62560; October 22, 2013) for a detailed description of previous Federal actions concerning this species.

Summary of Comments and Recommendations

In the proposed rule published on October 22, 2013 (78 FR 62560), we requested that all interested parties submit written comments on the proposal by December 23, 2013. We also contacted appropriate Federal and State agencies, scientific experts and organizations, and other interested parties and invited them to comment on the proposal. Newspaper notices inviting general public comment were published in the Virgin Islands Daily News and Primera Hora. All substantive information provided during comment periods has either been incorporated directly into this final determination or is addressed below.

Peer Reviewer Comments

In accordance with our peer review policy published on July 1, 1994 (59 FR 34270), we solicited expert opinion from nine knowledgeable individuals with scientific expertise that included familiarity with *Agave eggersiana*, *Gonocalyx concolor*, and *Varronia rupicola* and their habitats, biological needs, and threats. We received responses from one peer reviewer.

We reviewed all comments received for substantive issues and new information regarding the listing of *Agave eggersiana*, *Gonocalyx concolor*, and *Varronia rupicola*. The peer reviewer generally concurred with our conclusions in the proposed rule.

Public Comments

During the public comment period, we received one comment letter that addressed the proposed listing and the proposed critical habitat designation. We did not receive any requests for a public hearing. Comments pertaining to the critical habitat designation are addressed in that final rule, which is published elsewhere in today's **Federal Register**. The letter received regarding the proposed listing supports the listing and provided suggestions to improve the final rule.

Comment on Climate Change and Our Response

Specifically, the one substantive comment on the listing proposal we received stated that we should analyze climate change threats through the year 2100 at minimum. We do not have information to analyze the impacts of climate change through the year 2100. We evaluated climate change with the best scientific and commercial information available. At the moment, there are no specific studies discussing the projected impacts on any of these three species or their habitats. We discuss how changes caused by climate change may impact the three Caribbean plants in our threat assessment (October 22, 2013; 78 FR 62560) and we examine the potential consequences to these species and their habitats that rise from changes in environmental conditions associated with various aspects of climate change (i.e., intensity of hurricanes and tropical storms, followed by extended period of drought), and how, in combination with other factors, climate change can increase the impacts on the species. As additional information becomes available, we

will continue to address this threat, and develop actions to minimize the impact of climate change during the development of the recovery plan for the three Caribbean plants.

Summary of Changes from Proposed Rule

In this final rule, we made no substantive changes to the proposed rule.

Background

Agave eggersiana

Agave eggersiana is a flowering plant of the family Agavaceae (century plant family) endemic to the island of St. Croix in the U.S. Virgin Islands (USVI). It is currently known from coastal cliffs with sparse vegetation and dry coastal shrubland vegetation communities within the subtropical dry forest life zone of St. Croix, USVI (Ewel and Whitmore 1973, p. 72). The coastal cliffs where *Agave eggersiana* occurs are dominated by rocky formations and areas with less than 10 percent vegetative cover. These coastal cliffs are exposed to extremes of wind, salt spray, and low moisture, and they are usually sparsely vegetated with a canopy less than 3.3 feet (ft) (1 meter (m)) in height (Gibney *et al.* 2000, p. 7; Moser *et al.* 2010, Appendix A-11). It is distinguished from other members of the Agavaceae family by its acaulescent (without an evident leafy stem), non-suckering growth habit (vegetative reproduction that does not form offshoots around its base), and its fleshy, nearly straight leaves with small marginal prickles of 0.04 inches (in) (0.1 centimeters (cm)) long that are nearly straight (Britton and Wilson 1923,

p. 156; Proctor and Acevedo-Rodríguez 2005, p. 118). Its flowers are deep yellow and 2.0 to 2.34 in (5 to 6 cm) long. After flowering, the panicles (inflorescence) produce numerous small vegetative bulbs (bulbils), from which the species can be propagated (Proctor and Acevedo-Rodríguez 2005, p. 118). *Agave eggersiana* is not known to produce fruit, and like other *Agave* species, is monocarpic, meaning the plant dies after producing the spike or inflorescence. Furthermore, based on observations of cultivated plants, *A. eggersiana* requires at least 10 to 15 years to develop as a mature individual and to produce an inflorescence (David Hamada, St. George Village Botanical Garden, pers. comm., 2010).

Gonocalyx concolor

Gonocalyx concolor was described in 1970, as a new species of the genus *Gonocalyx*, family Ericaceae, for Puerto Rico (Nevling 1970, p. 221). *G. concolor* is similar to *G. portoricensis*, differences in distribution and flower morphology indicate that they are well-differentiated species (Nevling 1970, p. 224). *G. concolor* is a small evergreen shrub, mainly epiphytic (grows on the trunks of trees) or clambering (uses other vegetation as support), which may reach 15 ft (4.7 m) in length (Acevedo 2005, p. 227). It has been described as endemic from the elfin forest type at Cerro La Santa and from the ausubo (*Manilkara bidentata*) forest type at Charco Azul, both within the lower montane (an altitudinal zone in mountainous region characterized by distinctive flora and forest structure) very wet forest life zone in the Carite Commonwealth Forest (Ewel and Whitmore 1973, p. 41).

Varronia rupicola

Varronia rupicola was traditionally lumped into the genus *Cordia*. It has been identified in southwestern Puerto Rico, Vieques Island, and Anegada Island. It occurs on sites that lie within the subtropical dry forest life zone overlying a limestone substrate (Ewel and Whitmore 1973, p. 72). *Varronia rupicola* is a large shrub reaching up to 16 ft (5 m) in height. The alternate leaves are ovate to elliptic, 0.8 to 3.5 inches (in) (2 to 9 centimeters (cm)) long with an acute apex, rounded to obtuse at the base, and chartaceous (papery).

Please refer to the proposed listing rule for *Agave eggersiana*, *Gonocalyx concolor*, and *Varronia rupicola* (October 22, 2013; 78 FR 62560) for the complete background information of the species.

Summary of Biological Status and Threats

Section 4 of the Act (16 U.S.C. 1533) and its implementing regulations at 50 CFR part 424 set forth the procedures for adding species to the Federal Lists of Endangered and Threatened Wildlife and Plants. Under section 4(a)(1) of the Act, we may list a species based on any of the following five factors: (A) The present or threatened destruction, modification, or curtailment of its habitat or range; (B) overutilization for

commercial, recreational, scientific, or educational purposes; (C) disease or predation; (D) the inadequacy of existing regulatory mechanisms; and (E) other natural or manmade factors affecting its continued existence. Listing may be warranted based on any of the above threat factors, singly or in combination.

Please refer to the five-factor analysis in the proposed rule under **Summary of Factors Affecting the Species** for a more detailed discussion for each species' status assessment (October 22, 2013; 78 FR 62560). Our assessment evaluated the biological status of the species and threats affecting its continued existence. The assessment was based upon the best available scientific and commercial information. A summary of these factors follows.

Summary of Factor A: The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range

Agave eggersiana

The *Agave eggersiana* population found in Great Pond is the only one located in a conservation area. The remaining populations occur within privately owned lands and are threatened by development, or are growing in areas that are already developed and managed as tourism and residential projects and that will not support the continued existence of the plants. Based on information reported by the University of the Virgin Islands' Conservation Data Center (USVI-CLWUP 2004), at least three of the

populations (i.e., Protestant Cay, Gallows Bay, and Manchenil Bay) lie within areas identified by the Department of Planning and Natural Resources (DPNR) as high-density land use areas, and thus have a higher susceptibility to development in the near future. The coastal areas that harbor suitable habitat for the species are currently subject to urban and tourist development (O. Monsegur and M. Vargas, Service, pers. obs., 2010 and 2013). At least two proposed development projects have been identified within suitable habitat for the species (i.e., C&R Robin, LLC, and Seven Hills Beach Resort and Casino) (Weiss, CBD, pers. comm., 2010). Current information regarding the status of these development projects is not available to the Service.

The population at Protestant Cay has been affected by construction and management activities associated with the current use of the area, i.e., the disposal of garden debris from a hotel in the species' known habitat (O. Monsegur and M. Vargas, Service, pers. obs., 2010). As *Agave eggersiana* relies on asexual reproduction, the species depends on the bulbils becoming established. Covering the bulbils with debris may result in subsequent mortality of the bulbils and lack of natural recruitment, thus affecting the long-term survival of this population. Moreover, individuals located on the edges of the population are pruned as part of the gardens' maintenance. This practice may result in mortality or mutilation of individuals because the species is monopodial (single growth axis). The population at Protestant Cay is also threatened by competition with nonnative plant species. In this case, habitat modifications from urban development (e.g., road) and garden maintenance have created conditions for the establishment of invasive, nonnative species. Also, the undeveloped habitat on the cay is being rapidly

colonized by nonnative species (see Factor E discussion, below). *A. eggersiana* plants also seem to be stressed by competition with nonnative plants.

Another modification of habitat in the area was a sand ramp constructed in 2011, on the northeast side of the cay (T. Cummins and W. Coles, DPNR, pers comm., 2011; R. Platenberg and T. Cummins, DPNR, pers. comm., 2012; Zegarra, Service, pers. comm., 2012). It was documented that at least five individuals of *Agave eggersiana* were crushed or otherwise impacted by the excavation work (R. Platenberg and T. Cummins, DPNR, pers. comm., 2012).

The individuals located at Gallows Bay are within a developed residential complex that has the potential for future expansion, and thus may affect *Agave eggersiana* (O. Monsegur and M. Vargas, Service, pers. obs., 2010 and 2013). Moreover, the Gallows Bay area does not contain additional habitat to allow for population expansion. Remaining forested areas surrounding this location are characterized by an abundance of nonnative species. The small pockets that could be colonized by bulbils are occupied by *Sansevieria cylindrica* (African spear), a nonnative plant species that tends to form a complete cover of the understory (see Factor E discussion, below).

The area from Cane Garden Bay to Manchenil Bay on the south coast of St. Croix harbors four of the known natural populations of *Agave eggersiana* (Manchenil Bay, Vagthus Point, Cane Garden, and South Shore). According to DPNR personnel (Valiulis, pers. comm., 2010), these areas are advertised by realtors for tourism and residential

development. Furthermore, the areas along the south coast that have not been developed are used for cattle or hay production, minimizing the recovery of native vegetation and, therefore, the habitat for *A. eggersiana* (O. Monsegur and M. Vargas, Service, pers. obs., 2010 and 2013). The development of tourist and residential projects in these coastal areas may result in the extirpation of some populations or, at the least, will reduce the chances of the populations to expand or to colonize other areas. The effects of development projects are exacerbated by the low potential for natural recruitment due to the small number of populations and individuals.

The population of Great Pond is located between the entrance road of the East End Marine Park office and a private property currently advertised for sale. The population seems to be healthy based on the presence of different size plants and evidence of recent flowering events. However, the area near the population is mowed, and the access road limits the expansion of the population. Furthermore, the property adjacent to the population is privately owned and currently for sale (O. Monsegur and M. Vargas, Service, pers. obs., 2010 and 2013). The possible use of the area for additional residential or tourist development may affect the *Agave eggersiana* population. Owners will likely manage their properties as landscapes, which could lead to land clearing, additional mowing, other maintenance activities, and the introduction of nonnative plants. Moreover, the abundance of grasslands and the dominance of the nonnative plant *Megathyrsus maximus* (guinea grass) make the population of *A. eggersiana* susceptible to human-induced fires (addressed under Factor E, below).

The threats of possible construction and developments, and the current management of the habitat of the populations, may further limit the species. Direct consequences can be expected as impacting (harming) the individuals (e.g., cutting or mowing), while indirect consequences can be expected to create a habitat disturbance where nonnative plants can overpower *Agave eggersiana*. Currently, there are ongoing impacts on various populations that are expected to continue into the future.

Gonocalyx concolor

Habitat destruction and modification have been identified by species expert as the main threat to *Gonocalyx concolor* (Proctor 1992, p. 3; O. Monsegur, UPRM, unpubl. data, 2006; C. Pacheco and O. Monsegur, Service, unpubl. report, 2013, p. 3). In 1974, the Commonwealth of Puerto Rico granted special use permits for the construction of telecommunications facilities, and governmental and recreational facilities, within *G. concolor* habitat, affecting approximately 107 ac (43.5 ha) of lower montane very wet forest (Silander *et al.* 1986, p. 178). Currently known populations of *G. concolor* at Cerro La Santa are found in remnants of elfin forest vegetation located adjacent (less than 246 ft (75 m)) from telecommunication facilities, and at the edges (less than 9.8 ft (3 m)) of the road that provide access to the telecommunication facilities (C. Pacheco and O. Monsegur, Service, unpubl. report, 2013, p. 3). Below we discuss the three factors that may affect the current habitat or range of *G. concolor*: (1) Installation of telecommunication towers; (2) road improvement; and (3) vegetation management.

Land-use history of Cerro La Santa has shown that installation of telecommunication facilities for television, radio, and cellular communication, and for military and governmental purposes, has adversely impacted *Gonocalyx concolor*'s habitat (Silander *et al.*, 1986, p. 178) and, although not documented, presumably has directly affected individuals of the species. George Proctor (1992, p. 3) stated that the construction of a paved road and gigantic telecommunication towers on the summit ridge of Cerro La Santa destroyed much of the natural population of this species. Currently, the telecommunication tower and its associated facilities (i.e., access roads, security fences, guy wires) occupy approximately 6.1 acres (ac) (2.5 hectares (ha)) of the elfin forest in Cerro La Santa; this is habitat that *G. concolor* may have occupied in the past (C. Pacheco and O. Monsegur, Service, unpubl. report, 2013, p. 3). Although the populations at Cerro La Santa are located within a Commonwealth forest, this area is subjected to development for expansion of telecommunication infrastructure because permits to build new communication facilities or expand currently existing ones within or near Commonwealth forests are prevalent (DNER 2004a, p. 2). Expansion of the existing telecommunication facilities may result in loss of 27 individuals of *G. concolor* and their habitat. In Puerto Rico, towers for cellular communication, radio, television, and military and governmental purposes have represented a threat to those plant species that happen to occur only on mountaintops. The proliferation of these antennas has increased with the advent of cellular phone and related technologies. While the towers themselves may not occupy a very large area, construction activities, access roads, and other facilities have a much wider impact, resulting in the elimination of potential habitat for the species.

For the above reasons, we determined that installation of additional communications towers or expansion of the existing one at Cerro La Santa is a threat to *Gonocalyx concolor* by direct mortality and due to permanent loss, fragmentation, or alteration of its habitat.

Construction of a new access road and improvement of the existing access road to the existing communication facilities have been identified as a factor that could directly (destruction of individuals) or indirectly (slope instability and habitat degradation) reduce the number *Gonocalyx concolor* and its habitat at Cerro La Santa (Proctor 1992, p. 3; C. Pacheco and O. Monsegur, Service, unpubl. report, 2013, p. 3). Further, expanding the road that provides access to the telecommunication facilities may negatively affect the species' habitat and could result in loss of 11 mature individuals of *G. concolor* (C. Pacheco and O. Monsegur, Service, unpubl. report, 2013, p. 3). Additionally, clearing the native vegetation along the road may facilitate and accelerate colonization of invasive vegetation towards *G. concolor* habitat (see Factor E discussion, below). Destruction or modification of this kind of habitat may be irreversible. Therefore, the microhabitat conditions necessary for the recovery of the species may be lost if the habitat is modified for the expansion of the existing telecommunications facilities or construction of new communication facilities.

Vegetation management around the existing telecommunication towers and associated facilities and along the existing power lines that energize these facilities is a

threat to *Gonocalyx concolor* and its habitat (C. Pacheco and O. Monsegur, Service, unpubl. report, 2013, p. 3). Telecommunication companies periodically remove vegetation along the access roads, around the security fences, and under the guy wires (tensors) that are anchored in the forest. Additionally, maintenance staff of the Puerto Rico Energy and Power Authority (PREPA) periodically trim and clear the vegetation under the existing power lines that provide energy to the telecommunication facilities and adjacent communities. Presently, the Puerto Rico Department of Natural and Environmental Resources (DNER) is aware of the presence of *G. concolor* and the need to implement conservation measures for the species in Cerro La Santa. The existing telecommunication facilities and PREPA usually have a restricted perimeter delimiting the area that can be mowed and trimmed. However, maintenance activities outside of the perimeter have been conducted without the coordination with the forest manager, affecting the forest vegetation and *G. concolor* habitat (Hecsor Serrano-Delgado, DNER, pers. comm., 2013; O. Monsegur, UPRM, unpubl. report, 2006, p.1). In 2006, Omar Monsegur documented damages to an individual of *G. concolor* caused by vegetation removal activities outside of the fences (O. Monsegur, UPRM, unpubl. report, 2006, p. 1). Additionally, clearing the native vegetation along the access roads, around the telecommunication facilities, and under the power lines may facilitate and accelerate colonization of invasive vegetation in *G. concolor* habitat. See Factor E, below, for further discussion on invasive species.

Even though the population dynamics of the species are poorly known, we understand that the impacts discussed above could be detrimental to the species as a

whole. Clearing of vegetation may result in direct impacts (cutting of individuals) or indirect impacts (by opening forest gaps that can serve as corridors for invasive species) to the species. Vegetation management and maintenance of communication towers and facilities are a threat to *Gonocalyx concolor* due to changes in microclimate (a local atmospheric zone where the climate differs from the surrounding area) and plant species composition. Also, vegetation management around the existing facilities and along the access roads may be a direct and indirect threat to the *G. concolor* because it may alter the habitat condition, allowing invasive plants to colonize the area, and may result in direct physical damage to the species.

The species' rarity and restricted distribution makes it vulnerable to habitat destruction and modification. The scope of these factors is exacerbated because the most significant portion of the known population occurs adjacent to telecommunication facilities and at the edge of the existing access road. The activities related to these facilities are expected to continue into the future. Therefore, they are likely to have significant impact on *Gonocalyx concolor*.

Varronia rupicola

The species' rarity and restricted distribution make it vulnerable to habitat destruction and modification. About 50 percent of known *Varronia rupicola* individuals in Puerto Rico occur on private lands (i.e., Yauco, Peñuelas, and Ponce) in areas subject to urban development. Moreover, the habitat at Peñuelas and Ponce may remain

underestimated in relation to the presence of the species as the area has not been extensively explored. The habitat in the municipalities of Peñuelas and Ponce has been severely fragmented for urban development (i.e., housing projects, hotels, jails, landfills, rock quarries, and Puerto Rico Highway Number 2 (PR 2)). The habitat has been further fragmented by the use of these forested areas by PREPA as a right-of-way for power lines, and additional habitat was impacted for a former proposed gas pipeline (Gasoducto Sur). At least 1,200 ac (485 ha) of prime dry forest habitat from Guánica to Ponce are currently proposed for urban and industrial developments, which are evaluated by the Puerto Rico planning board (<http://www.jp.gobierno.pr>). These include the areas where the Ponce populations were located by Service staff. Future projects may threaten these populations with fragmentation, and possibly extirpate currently known individuals. Despite the species' biology suggesting its ability to colonize disturbed areas, it is very likely that once the habitat is fragmented, *V. rupicola* will be outcompeted by nonnative plant species (see Factor E discussion).

In Peñuelas, the species is found in an area that is currently under urban development. Breckon and Kolterman (1996) reported a healthy population of *Varronia rupicola* in this area located at El Peñón de Ponce (Municipality of Peñuelas), which is part of a residential development called “Urbanización El Peñón.” At this site, *V. rupicola* plants grows within residential lots, and although the lots are large in size, current and ongoing construction and deforestation (some lots have been completely cleared for house construction) threaten this population. In 2007, Monsegur and Breckon (2007, p. 6) reported that one individual plant adjacent to “Urbanización El Peñón” was

eliminated by the improvement of PR 2. The authors reported that vegetation was removed and the area was bulldozed, apparently as part of a project to control run-off from the ravine.

In Yauco, the species occurs within private properties that may be subject to urban development (<http://www.jp.gobierno.pr>). In fact, urban development has encroached remnants of native dry forest areas, resulting in the isolation or disjunction of populations of rare plants, hence, reducing suitable habitat for the species. These areas are also threatened by deforestation for agricultural practices such as raising cattle, cattle grazing, and for the extraction of fence posts (O. Monsegur, Service, pers. obs., 2005). The known population at Yauco was observed at the edge of an existing dirt road. Therefore, any road expansion may result in the extirpation of individuals, habitat modification, and intrusion of nonnative plants.

In the Guánica Commonwealth Forest and the Vieques Island National Wildlife Refuge (NWR), *Varronia rupicola* is found at the edge of trails and roads, making the species prone to be affected by management activities (e.g., widening of trails, road repairs). Additionally, several individuals of *V. rupicola* are found underneath power lines of PREPA at the Guánica Commonwealth Forest, where they are threatened by maintenance activities such as cutting or the use of herbicides. PREPA has the right to access the power lines for maintenance and service in case of emergencies. Damage to individual plants caused by maintenance activities has been observed in the past (O. Monsegur, Service, pers. obs., 2009). This makes a significant part of the Guánica

populations prone to extirpation, despite the existence of regulatory mechanisms (see Factor D discussion, below).

Furthermore, despite being a National Wildlife Refuge, the Vieques site (Puerto Ferro) is considered as an active ammunition site due to the previous use of Vieques Island as a bombing range by the U.S. Navy (http://www.navfac.navy.mil/products_and_services/ev/products_and_services/env_restoration/installation_map/navfac_atlantic/vieques.html). Although there are no current plans to conduct vegetation removal to investigate the ammunitions in Puerto Ferro (F. Lopez, Service, pers. comm., 2013), the investigation process at Vieques has proved to be dynamic and there is a possibility that clearing of native vegetation will be required to conduct removal of ammunitions in the future.

Varronia rupicola is also found in the western half of Anegada Island, and the population appears to be healthy. However, despite efforts to maintain biodiversity and promote conservation on Anegada, *V. rupicola*, along with other rare plant species and their preferred limestone habitat, faces threats of future habitat fragmentation, habitat modification, and invasive species (Pollard and Clubbe 2003, p. 5; McGowan *et al.*, 2006, p. 4). Anegada is under heavy pressure for residential and tourism development (McGowan *et al.*, 2006, p. 4), resulting in improvement and construction of roads, which increase habitat loss and fragmentation.

Degradation of habitat represents a threat to *Varronia rupicola*. About half of the known populations of *V. rupicola* and its suitable habitat are within privately owned land, which is being modified or is proposed to be modified for urban development. In addition, habitat fragmentation by clearing of vegetation, road construction, and right-of-way maintenance (cutting plants and use of herbicides) can limit the species' survivability where these activities create the conditions for nonnative plants to outcompete *V. rupicola*. We expect that this threat will continue and become more significant in the future.

Summary of Factor B: Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

Agave eggersiana is recognized as an ornamental plant, and is locally distributed by botanical gardens (St. George Village Botanical Garden) and the St. Croix Environmental Association to residents for use in private gardens. Most cultivated populations are groomed, and the residents do not allow natural recruitment. Therefore, we consider collection to be a threat to the species, due to the few remaining natural populations and the demand for these plants as ornamentals. Over-collection from natural populations may compromise the natural recruitment and the recovery of *Agave eggersiana*.

We do not believe that over-collection is a threat to *Gonocalyx concolor* or *Varronia rupicola*.

Summary of Factor C: Disease or Predation

The genus *Agave* is widely affected by the agave snout weevil (*Scyphophorus acupunctatus*). This weevil has a wide distribution that includes the Greater Antilles (i.e., Cuba, Jamaica, Hispaniola, and Puerto Rico) (Vaurie 1971, p. 4; Setliff and Anderson 2011, p. 1). The larvae of this weevil feed on the starchy base of the plant, increasing the risk of infestation by pathogens such as a virus or fungus, later resulting in the death of the plant (Vaurie 1971, p. 4). At this time, there is no information about the occurrence of the agave snout weevil within St. Croix. However, it has been documented to be found on adjacent islands such as St. Thomas and Water Island.

We do not have evidence of the agave snout weevil's presence on St. Croix, nor specifically on *Agave eggersiana*. However, given the abundance of potential weevil carrying vectors (such as nonnative agaves transplanted from other islands in local gardens), we consider that the weevil's arrival to this island to be likely. The agave snout weevil's presence on nearby islands is a concern, especially where there is constant traffic (commuting) among islands with local and international trade. This could potentially increase the risk of this weevil to arrive and infest the island at any time. Moreover, the island of St. Croix harbors other types of *Agave*, which could potentially

become stepping stones for the weevil to spread and infest the few and limited populations of *A. eggersiana*.

Scar tissue has been observed on some individuals of *Agave eggersiana*, but there is no direct evidence that the severity of this stressor has affected the species as a whole. However, disease caused by the agave snout weevil could potentially affect *A. eggersiana* at a population level if it was located on St. Croix. Thus, based on our analysis of the best available scientific and commercial available data, we find that disease may become a significant threat to the overall status of *A. eggersiana* by affecting the long-term survival of the species.

We have no information indicating that disease or predation is a current threat to *Gonocalyx concolor* or *Varronia rupicola*.

Summary of Factor D: The Inadequacy of Existing Regulatory Mechanisms

The Territory of the U.S. Virgin Islands currently considers *Agave eggersiana* as endangered under the Virgin Islands Indigenous and Endangered Species Act (Law No. 5665) (V.I. Code, Title 12, Chapter 2). This law, signed in 1990, amended an existing regulation (Bill No. 18-0403) to provide for the protection of endangered and threatened wildlife and plants by prohibiting the take, injury, or possession of indigenous plants. As we mentioned above, *A. eggersiana* is currently being used for private landscaping on St.

Croix. At present, we do not have information about the sources of the individuals used for such purposes. However, we are concerned about the removal of individuals from natural populations for landscaping. Based on the number of individuals currently used for private gardens and the landscape practices in private areas, such as pruning and mowing of populations, we believe that protection provisions under local regulation may not be appropriately enforced. Rothenberger *et al.* (2008, p. 68) indicated that the lack of management and enforcement capacity continues to be a significant challenge for the USVI, because enforcement agencies are chronically understaffed, and territorial resource management offices experience significant staff turnover, particularly during administration changes.

One of the currently known populations of *Varronia rupicola* lies within the Vieques NWR (Puerto Ferro population). Collecting and managing plant material (including seeds) within a national wildlife refuge are regulated, and require a permit from the refuge manager (FWS Form 3-1383-R). The National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. 668dd-668ee, as amended by the National Wildlife Refuge System Improvement Act of 1997) provides guidance for management and public use of the refuge system.

In 1999, the Commonwealth of Puerto Rico approved Law No. 241, also known as New Wildlife Law of Puerto Rico (“Nueva Ley de Vida Silvestre de Puerto Rico”). The purpose of this law is to protect, conserve, and enhance both native and migratory wildlife species, including plants; declare all wildlife species within its jurisdiction as

property of Puerto Rico; and regulate permits, hunting activities, and nonnative species, among others. However, as we mentioned above under the Factor A discussion, despite this protection some individuals of *Gonocalyx concolor* and *Varronia rupicola* have been pruned, and in some cases eliminated, as result of unauthorized activities, such as vegetation removal within the Commonwealth Forest (O. Monsegur, UPRM, unpubl. report, 2006, p. 1) and within privately owned lands (Monsegur and Breckon 2007, p. 6). Therefore, we believe that protection provisions under Law No. 241 are not being adequately enforced.

In 1998, the Commonwealth of Puerto Rico approved Commonwealth Law No. 150, known as Puerto Rico Natural Heritage Law (Ley del Programa de Patrimonio Natural de Puerto Rico). The purpose of Law No. 150 is to create the DNER Natural Heritage Program. This program has the responsibility to identify and designate as critical elements some rare, endangered, or threatened species that should be considered for conservation, because of their contribution to biodiversity and because of their importance to the natural heritage (DNR 1988, p.1). Currently, *Gonocalyx concolor* and *Varronia rupicola* are considered as critical elements by the DNER Natural Heritage Program. Law No. 150 does not provide penalties for actions that may adversely affect critical elements; however, the law triggers other Commonwealth laws and regulations, such as Law No. 133 and Regulation No. 6769 (see below), that provide protection to critical elements.

The Carite and Guánica Commonwealth Forests are protected by Law No. 133 (12 L.P.R.A. sec. 191), 1975, as amended, known as the Puerto Rico Forest Law (“Ley de Bosques de Puerto Rico”), as amended in 2000. Section 8(A) of Law No. 133 prohibits cutting, killing, destroying, uprooting, extracting, or in any way damaging any tree or vegetation within a Commonwealth forest without authorization of the Secretary of the DNER. Although management plans for Commonwealth forests include the protection and conservation of species classified under DNER regulations as critical element, endangered, or threatened, on occasions the location of such species in the forests makes enforcement of these regulations a difficult task. As previously mentioned, *Gonocalyx concolor* and *Varronia rupicola* are located adjacent to trails, near access roads, and below power lines, where they are susceptible to maintenance practices. According to DNER forest managers, on several occasions, coordination between forest personnel and field staff from PREPA has not been effective to avoid damaging species protected by Commonwealth laws, including *V. rupicola* and *G. concolor* (M. Canals, DNER, pers. comm. 2008; H. Serrano-Delgado, DNER, pers. comm. 2013).

In 2004, the Commonwealth of Puerto Rico adopted Regulation No. 6769, Regulation of Special Permits for the Use of Communications and Buildings Associated to Electronic Systems of Communication within Commonwealth Forests in Puerto Rico (“Reglamento de Permisos Especiales para Uso de Comunicaciones y Edificaciones Asociadas a Sistemas Electrónicos de comunicación en los Bosques Estatales”), which provides guidance for the installation and maintenance of telecommunication facilities within Commonwealth forests and for the protection of natural resources. Article 7(d) of

this regulation states that during installation, operation, and maintenance of telecommunication facilities, conservation measures should be taken to avoid or minimize impacts on species protected by DNER and Federal agencies (DNER 2004a, p. 13). However, individuals of *Gonocalyx concolor* have been affected by maintenance activities of existing communication facilities, making implementation of this regulation a challenging task (see discussion under Factor A, above, and Factor E, below).

In 2004, DNER approved Regulation 6766 to regulate the management of endangered and threatened species in the Commonwealth of Puerto Rico (“Reglamento para Regir el Manejo de las Especies Vulnerables y en Peligro de Extinción en el Estado Libre Asociado de Puerto Rico”). Article 2.06 of Regulation 6766 prohibits collecting, cutting, and removing, among other activities, listed plants within the jurisdiction of Puerto Rico. *Gonocalyx concolor* and *Varronia rupicola* are not included in the list of protected species under Regulation 6766. However, as indicated above, Law No. 241 provides protection to all wildlife species (including plants) under Commonwealth jurisdiction, even those on private lands.

On the island of Anegada, there are various conservation and education efforts taking place for the protection of rare plant and animal species (Wenger *et al.* 2010, p. 8). However, we are unaware of any formal regulatory mechanism for protecting *Varronia rupicola*. On November 3, 1999, a portion of western Anegada (2,646 ac (1,071 ha)) was designated as a Ramsar site and added to the List of Wetlands of International Importance (Western Salt Ponds of Anegada). A portion of the preferred limestone habitat of *V.*

rupicola lies within this site, which is owned by the British government. Although this designation does not necessarily provide legal protection status, the purpose of Ramsar sites is to ensure the perpetuation of ecological functions of those sites by means of a wise-use approach.

In summary, *Agave eggersiana*, *Gonocalyx concolor*, and *Varronia rupicola* and their habitats are partially protected by Federal, Commonwealth, Territory, and local regulations. However, after evaluating the information available on the implementation of the existing laws, we determined those regulatory mechanisms do not provide adequate protection to the species. In particular, the enforcement of existing laws has not been effective, because harming or injuring (mowing or pruning) *Agave eggersiana* has been reported. In addition, the implementation and enforcement of measures to protect individuals of *V. rupicola* located adjacent to existing trails and below power lines within Commonwealth forests have not been effective. The same problem has occurred with *G. concolor* during maintenance of communication towers. Additionally, enforcement on private lands continues to be a challenge, as accidental damage or extirpation of individuals has occurred due to lack of knowledge of the species by private landowners.

Summary of Factor E: Other Natural or Manmade Factors Affecting Their Continued Existence

Invasive Species

Invasive plant species can affect native ecosystems at three levels: the genetic level, where the number of individuals of native species can be reduced below the minimum necessary for persistence; the species diversity level, where the number of species present and their distribution can be reduced; and the ecosystem level, where the functioning of the ecosystem can be changed (Rippey *et al.* 2002, p. 170). Nonnative species can be very aggressive and compete with native species for sunlight, nutrients, water, and ground cover. Once established, these nonnative species typically dominate the landscape, and the novel forest is characterized by a decrease in the number of endemics (Lugo and Helmer 2003, p. 145). The impacts of invasive species are among the greatest threat to the persistence of native rare species and their habitats (Thomson 2005, p. 615).

Although invasive plant species have not been documented as a current threat to *Varronia rupicola*, they may become so in the future. Studies conducted within the Guánica Commonwealth Forest indicate that some nonnative tree species (e.g., *Leucaena leucocephala*) can persist as a dominant canopy species for at least 80 years (Wolfe 2009, p. 2). The same is expected to occur with nonnative grass species (e.g., *Megathyrsus maximus*). These invasive species may invade recently disturbed (naturally or by human impacts) areas and occupy the suitable habitat of *V. rupicola*. Despite the quality and overall diversity of the habitat that harbors *V. rupicola* populations in the southern coast of Puerto Rico, recent developments and habitat fragmentation have served as a corridor for invasive species (e.g., right-of-way for the former Gasoducto Sur; O. Monsegur, Service, pers. obs., 2013). On the island of Anegada, numerous invasive plants have

been documented in the town of The Settlement, three of which have been observed moving towards natural habitats (McGowan *et al.* 2006, p. 4), further promoting the risk of wildfires that can affect *V. rupicola*.

With respect to *Agave eggersiana*, the populations at Protestant Cay, Gallows Bay, and Great Pond are surrounded by dense stands of different species of *Sansevieria*, an herb native to Africa. This invasive species seems to be occupying the ecological niche adjacent to known populations of *A. eggersiana* (O. Monsegur, Service, pers. obs., 2013). This invasive species can constrain the number of individuals of *A. eggersiana* and reduce the species' limited populations even more.

Invasive native plants, such as the ferns *Gleichenella pectinata* and *Sticherus bifidus*, may invade and alter diverse native communities, often resulting in plant monocultures that support few wildlife species (Walker *et al.* 2010, p. 627). These ferns can colonize disturbed areas faster than other native plants and may grow into dense mats, thereby excluding native plants (Walker *et al.* 2010, p. 634). Additionally, the mats formed by these species serve as fuel for fires and, in fact, seems to be fire-tolerant. The invasive, nonnative grass *Pennisetum purpureum* (elephant grass) is a fire-adapted species that, in dense growth, can suppress most grasses, herbs, and tree seedlings (J. K. Francis, ITF, internet data, 2013).

These invasive ferns and grass are currently found occupying areas disturbed by fire, landslides, and road construction in Cerro La Santa, and have the potential to affect

Gonocalyx concolor by increasing fire incidences, microclimate, and nutrient cycling of the habitat on which this species depends. At present, we have no information about the competitive abilities of *G. concolor* in such a situation. Therefore, the effect of invasive species within the *G. concolor* habitat should be considered a threat to the species.

Human-induced Fires

Fire is not a natural event in subtropical dry or moist forests in Puerto Rico and the U. S. Virgin Islands. The vegetation in the Caribbean is not adapted to fires, because this disturbance does not naturally occur on these islands (Brandeis and Woodall 2008, p. 557; Santiago-García *et al.* 2008, p. 604). Human-induced fires could modify the landscape by promoting nonnative trees and grasses, and by diminishing the seed bank of native species (Brandeis and Woodall 2008, p. 557). In some cases, fires may maintain extensive areas of young forest and grasslands, slowing the recovery of ecosystems and, therefore, impairing the delivery of ecosystem services (Brandeis and Woodall 2008, p. 557). For example, the nonnative *Megathyrsus maximus* is well adapted to fires and typically colonizes areas that were previously covered by native vegetation. Furthermore, the presence of this species increases the amount of fuel and the intensity of fires. Therefore, damage caused by fires to the ecosystems, particularly to juvenile plants, might be irreversible.

Human-induced fires may lead to destruction of the native vegetation seed bank and may create conditions favorable for the establishment of nonnative plant species

adapted to fires (e.g., *Leucaena leucocephala* and *Megathyrsus maximus*) that may outcompete *Varronia rupicola* and *Agave eggersiana*. Furthermore, the presence of *M. maximus* and other grass species increases the amount of fuel and the intensity of fires that may affect endemic populations. Seedling mortality after fires is related to the differences on fuel loads and the different fire intensities (Santiago-García *et al.* 2008, p. 607). The *V. rupicola* populations that occur along the municipalities of Yauco, Peñuelas, and Ponce are susceptible to forest fires, particularly on private lands where fires are accidentally or deliberately ignited. Evidence of recent fires within the habitat and adjacent to known populations of *V. rupicola* in Peñuelas and Ponce have been observed by Service biologist Omar Monsegur (2011 and 2013). *Varronia rupicola* populations within the Guánica Commonwealth Forest may be protected, as this conservation area has an active fire control program (M. Canals, DNER, pers. comm. 2008). Nonetheless, Miguel Canals, Guánica Commonwealth Forest Manager, indicates that fires still occur in the forest, particularly on the periphery along roads (Canals, DNER, pers. comm. 2008). Moreover, accidental fires have been reported below the PREPA power lines adjacent to known populations of *V. rupicola*.

On the island of St. Croix, human-induced fires are also frequently reported, and most of them appear to have been originated close to existing roads (Chakroff 2010, p. 41). Estate Granard, Estate Jack's Bay, and Estate Isaacs Bay are among the areas identified as fire hotspots (Chakroff 2010, p. 42). One of the extant populations of *Agave eggersiana* is found on Estate Granard, and Jack's Bay and Isaacs Bay Estates are within the historical range for the species. In fact, from 2006 to 2009, there were between one

and six fires in these estates (Chakroff 2010, p. 42). Human-induced fires particularly threaten the *A. eggersiana* population at Great Pond due to the abundance of nonnative grasses in this area. Service's personnel in St. Croix just documented a wildfire affecting the population of *Catesbaea melanocarpa* (Claudia Lombard, Service, pers. comm. 2013). This population is located less than 0.3 mi (0.5 km) from the *A. eggersiana* population at Manchenil Bay.

Human-induced fire is also a current threat to *Gonocalyx concolor* at Cerro La Santa. Areas adjacent to (less than 33 ft (10 m) from) a population of this species have been affected by such fires (O. Monsegur, UPRM, unpubl. data, 2006). Fire effects could accelerate the colonization of invasive plants and change the vegetation composition of Cerro La Santa (see discussion under Factor A, above). Currently, *Pennisetum purpureum*, a nonnative grass, is occupying these areas, making them vulnerable to human-induced fires. During the dry season (March through May), the fern *Gleichenella pectinata*, and other fern species that have colonized landslides and roadsides, form dense mats of dry material that serve as fuel for fires. Although Cerro La Santa is located in the wet forest, fires still occur in the area, particularly along roads, during the dry season (C. Pacheco, USFWS, pers. obs. 2013). Due to the small size of *G. concolor* populations and their proximity to areas susceptible to human-induced fires, the Service considers habitat modification by fires as a threat to the species.

Hurricanes and Climate Change

The islands of the Caribbean are frequently affected by hurricanes. The U.S. Virgin Islands have been hit by five major hurricanes in recent years: Hugo (1989), Luis and Marilyn (1995), Lenny (1999), and Omar (2008). Examples of the visible effects of hurricanes on the ecosystem include massive defoliation, snapped and wind-thrown trees, large debris accumulations, landslides, debris flows, altered stream channels, and transformed beaches (Lugo 2008, p. 368). Successional responses to hurricanes can influence the structure and composition of plant communities in the Caribbean islands (Van Bloem *et al.* 2003, p. 137; Van Bloem *et al.* 2005, p. 572; Van Bloem *et al.* 2006, p. 517; Lugo 2000, p. 245). Hurricanes can produce sudden and massive tree mortality, which is variable among species (Lugo 2000, p. 245). As endemics to the Caribbean, *Varronia rupicola*, *Agave eggersiana*, and *Gonocalyx concolor* would be expected to be well adapted to tropical storms and the prevailing environmental conditions in this geographical area. However, the resilience of rare and endangered native species populations may be limited or constricted by the reduced number of populations and individuals, making the populations vulnerable to stochastic events.

The reduced number and small size of *Varronia rupicola* and *Agave eggersiana* populations in Puerto Rico and St. Croix, respectively, make these species susceptible to hurricanes impacts (e.g., extirpation). In the case of *A. eggersiana*, the impacts may be exacerbated by the reproductive biology of the species (i.e., the species depends on asexual reproduction, plants dying after flowering, and limited dispersal of bulbils). Therefore, impacts to a population may compromise its natural recruitment. In addition,

for *V. rupicola*, a severe hurricane could result in extensive defoliation and could cause stem damage.

Populations of *Varronia rupicola* may be threatened by climate change, which is predicted to increase the frequency and strength of tropical storms and can cause severe droughts (Hopkinson *et al.* 2008, p. 260). Rather than assessing climate change as a single threat, we examined the potential consequences to species and their habitats that arise from changes in environmental conditions associated with various aspects of climate change. For example, climate-related changes to habitats or conditions that exceed the physiological tolerances of a species, occurring individually or in combination, may affect the status of a species. In fact, vulnerability to climate change impacts is a function of sensitivity, exposure, and adaptive capacity of species (IPCC 2007, p. 89; Glick and Stein 2010, p. 19). For instance, severe droughts may compromise seedling recruitment, as they may result in deaths of small plants, or may compromise the viability of seeds. Despite the wide distribution of *V. rupicola* and the number of populations, the number of individuals per population may be too low to sustain a positive recruitment of individuals. This may explain the low number of intermediate-sized, nonreproductive individuals of *V. rupicola* observed in Guánica and Ponce, when compared to the high numbers of young seedlings (Omar A. Monsegur, Service, pers. obs. 2013).

On the island of Anegada, climate-induced sea-level rise could lead to the extirpation of *Varronia rupicola*. The preferred habitat of this species on that island is in

lower elevations, and more than 40 percent of the island is less than 9.8 ft (3 m) above sea level (Wenger *et al.* 2010, p. 8). Similarly, *Agave eggersiana* occurs very close to beach areas in coastal areas. At least two *A. eggersiana* populations are located on a coastal cliff, susceptible to coastal erosion and landslides. Therefore, we believe that cyclonic surges and coastal erosion associated with hurricanes may significantly affect the populations located along the coastal areas of St. Croix (i.e., Manchenil Bay, South Shore, Cane Garden, Vagthus Point, and Protestant Cay), due to their proximity to cliffs and the shoreline.

The limited distribution and low number of populations (3) and individuals (172 historically reported) of *Gonocalyx concolor* may exacerbate its vulnerability to natural events such as hurricanes and landslides, and compromise its continued existence. Damage to higher elevation forested habitat is usually greater during hurricane events (Weaver 2008, p. 150). *Gonocalyx concolor* is extremely vulnerable due to its habitat requirements and the fact that it is usually found growing on the canopy of the tallest trees in Cerro La Santa and Charco Azul. The species is usually associated with old trees with abundant vines and epiphytes that provide horizontal structure for the colonization of the species (probably a habitat requirement for the germination of seeds). Hurricane winds often lead to tree defoliation, loss of small and large branches, and uprooting, resulting in damage to adjacent trees and understory vegetation. As a result, gaps are produced in the vegetation, causing temporary changes in the understory microclimate due to high light levels and temperature (Walker *et al.* 2010, p. 626). Therefore, damage to the forest canopy may result in a direct impact to individuals of *G. concolor* that may

fall to the ground and probably be outcompeted by pioneer plant species that get established during early successional stages after hurricanes.

The recovery of elfin forest vegetation after hurricanes is usually slow, and the early regeneration process is dominated by a few species (Weaver 2008, p. 150).

Furthermore, in the absence of knowledge of the reproductive capacity and ecological requirements of *Gonocalyx concolor*, it is difficult to predict its recovery after natural events such as hurricanes and tropical storms, particularly when the frequency and intensity of these weather events is expected to increase with climate change.

The habitat where *Gonocalyx concolor* occurs is susceptible to landslides during rain events mostly associated with tropical storms and hurricanes. Sometimes rainfall reaches 24 in (60 cm) in a single storm event, causing floods and interacting with topography and geologic substrate to induce mass wasting events (e.g., landslides; Lugo 2000, p. 246). In 1998, during Hurricane Georges, a landslide adversely affected approximately 2 ac (0.8 ha) of elfin forest at Cerro La Santa (Hector Serrano-Delgado, DNER, pers. comm. 2013). A massive landslide in the area where the species occurs would not only take out individuals of *G. concolor*, but would also modify the habitat necessary for the species and lead to conditions favoring the establishment of invasive and weedy vegetation that may permanently modify the habitat and outcompete *G. concolor* (see invasive species discussion under Factor E, above). As documented during Hurricane Georges, and based on the current conditions of the habitat at Cerro La Santa and Charco Azul, landslides are a current threat to this species. As with *Agave*

eggersiana and *Varronia rupicola* (see discussion above), overall impact and the cumulative effects of climate change are also expected to have long-term adverse effects on *G. concolor*. *Gonocalyx concolor* is considered a species with very specific ecological requirements and that occupies biological islands (i.e., dwarf forests on high elevations of Puerto Rico). Thus, predicted changes on the structure of the vegetation due to climate change may result in the irreversible extirpation of the prime habitat for the species.

Low Reproductive Capacity, Highly Specialized Ecological Requirements, and Genetic Variation

Small and isolated populations of rare plants often display reduced fitness as reduced reproductive output, seedling performance, or pollen viability (Holmes *et al.* 2008, p. 1031). In the case of *Gonocalyx concolor*, little is known about its reproductive capacity, recruitment, and genetic variation. The low number of individuals per population of a monoecious species (both sexes in the same flower), like *G. concolor*, suggests it has highly specialized ecological requirements, production of viable seeds rarely occurs, or there is a pollinator limitation. Despite the ongoing monitoring of the known population of *G. concolor*, no seedling recruitment has been observed in the wild. Knowing the phenology of a plant showing limited distribution is important in understanding the species' biology and ecology, such as the timing of flowering, fruiting, germination and subsequent growth, and accumulation of biomass in the field (Ruml and

Vulic 2005, p. 218). Additionally, given the extremely limited geographic distribution of *G. concolor*, it is likely that its genetic variability is low.

In the case of *Agave eggersiana*, its reproductive biology is characterized by its dependence on asexual reproduction (i.e., bulbils). Current evidence suggests that the wild and cultivated populations of *A. eggersiana* have minimum genetic variation. This would result in the loss of alleles by random genetic drift, which would limit the species' ability to respond to changes in the environment (Honnay and Jacquemyn 2007, p. 824).

Cumulative Effects: Factors A through E

Agave eggersiana

The limited distributions and small population sizes of *Agave eggersiana* make this species very susceptible to further habitat loss (Factor A), diseases (Factor C), and competition with nonnative species (Factor E). Hurricanes, human-induced fires, and climate changes (Factor E) exacerbate current threats to the species. Furthermore, although the species is protected by territorial law, enforcement still is a challenge (Factor D), threatening the continued survival of the species. While these threats may act in isolation, it is very likely that two or more of these stressors (e.g., habitat loss and diseases) act simultaneously or in combination, resulting in cumulative impacts to populations of *A. eggersiana*.

Gonocalyx concolor

The rarity and specialized ecological requirements of *Gonocalyx concolor* (Factor E) make this species extremely vulnerable to habitat destruction or modification (Factor A), and to other natural or manmade factors, such as low reproductive capacity, possible low genetic variation, invasive species, hurricanes, landslides, human-induced fires, and climate change, particularly because it is confined to small geographical areas (Factor E). Furthermore, implementation and enforcement of effective measures to protect *G. concolor* have not prevented impacts to the species (Factor D). Although the above mentioned threats may act in isolation, it is very likely that two or more of these stressors act simultaneously or in combination (e.g., hurricanes and landslides; fires and invasion of nonnative plant species), resulting in cumulative impacts to populations of *G. concolor*, challenging its recovery.

Varronia rupicola

Varronia rupicola has a somewhat extended distribution in southern Puerto Rico. However, the species is represented by small and fragmented populations, and about half of them occur within private lands subject to urban development, making the species prone to destruction, modification, or curtailment of its habitat (Factor A). Moreover, other natural or manmade factors such as invasive species, human-induced fires, hurricanes, and climate change (Factor E) also pose threats to *V. rupicola*.

Implementation and enforcement of regulatory mechanisms to protect the species have not been effective, particularly because enforcement on private lands continues to be a challenge (Factor D). Therefore, it is very likely that cumulative effects of these threats (e.g., poorly implemented regulatory mechanisms and habitat destruction) result in limitation, or even local extirpation, of *V. rupicola* populations.

Determinations

Determination for *Agave eggersiana*

Agave eggersiana is threatened by limited habitat and habitat loss (e.g., construction of roads, and residential and tourist developments and landscaping (Factor A)) and the potential for a disease to wipe out the limited populations (Factor C). In addition, agave is threatened by a high possibility of commercial collection for ornamental uses (Factor B), and competition with invasive, nonnative plants, as well as hurricanes and human-induced fires, which are further exacerbated by climate change (Factor E). Due to lack of enforcement, existing regulatory mechanisms are not adequately reducing these threats (Factor D). All of these threats currently occur rangewide and are likely to continue into the foreseeable future at a medium to high intensity.

Based on our evaluation of the best available scientific and commercial information on the species, the significant threats affecting *Agave eggersiana* and its habitat, as well as future potential threats, we have determined the species is currently in danger of extinction throughout all of its range, as a result of the severity and immediacy of threats currently impacting the species. The remaining habitat and populations are threatened by a variety of factors acting in combination to reduce the overall survivorship of *A. eggersiana*. The risk of extinction for *A. eggersiana* is high because the remaining populations are isolated and small. Therefore, we have determined that *A. eggersiana* meets the definition of an endangered species in accordance with sections 3(6) and 4(a)(1) of the Act. We find that a threatened species status is not appropriate for *A. eggersiana* because the species is very limited in numbers and in populations, and because threats are current and ongoing, occurring rangewide, and expected to increase and continue into the future.

As stated above, the threats to the survival of *A. eggersiana* occur throughout the species' range and are not restricted to any particular significant portion of that range. Accordingly, our assessment and determination applies to the species throughout its entire range.

Determination for *Gonocalyx concolor*

Gonocalyx concolor has a very limited distribution. According to our assessment, this species is threatened by habitat destruction or modification (Factor A) associated

with maintenance and potential expansion of telecommunication facilities, and to other natural or manmade factors (i.e., low reproductive capacity, possible low genetic variation, invasive species, hurricanes, landslides, human-induced fires, and climate change (Factor E)). Due to ineffective implementation and enforcement, existing regulatory mechanisms are not adequately reducing these threats (Factor D). All of these threats currently occur rangewide and are likely to continue into the foreseeable future at a medium to high intensity.

Based on our evaluation of the best available scientific and commercial information on the species, the significant threats affecting *Gonocalyx concolor* and its habitat, as well as future potential threats, we have determined the species is currently in danger of extinction throughout all of its range, because of the severity and immediacy of threats currently impacting the species. Overall, its habitat has been significantly reduced, and the remaining habitat and populations are threatened by a variety of factors acting in combination to reduce the overall viability of the species. The risk of extinction of *Gonocalyx concolor* is high because the remaining population is small, is isolated, and has limited potential to expand. As a result, we find that *G. concolor* meets the definition of an endangered species. We find that a threatened species status is not appropriate for *G. concolor* because the species is already very limited in numbers and distribution (i.e., it has a contracted range), and the threats are current and ongoing, occurring rangewide, and expected to continue into the future.

As stated above, the threats to the survival of the species occur throughout the species' range and are not restricted to any particular significant portion of that range. Accordingly, our assessment and determination applies to the species throughout its entire range.

Determination for *Varronia rupicola*

The rarity of *Varronia rupicola* and its restricted distribution renders it vulnerable to habitat destruction and modification. *Varronia rupicola* is threatened primarily by human-induced fires within its prime habitat. Habitat modification by urban development has promoted the invasion of its habitat by exotic grasses that are typically fire-adapted and, therefore, increase the chances of fires. Overall, nonnative plants and fires may result in extirpation of populations of *V. rupicola* by killing individuals, limiting natural recruitment, or permanently modifying habitat and conditions necessary for the species' establishment. Furthermore, due to the species' limited numbers and distribution, hurricanes may extirpate entire populations, and in the case of a highly fragmented habitat, hurricanes may further promote the invasion of forest gaps by nonnative plant species. Similarly, severe droughts resulting from climate change may compromise the survival of seedlings and diminish natural recruitment within wild populations.

The species has a wide distribution throughout the Puerto Rican bank (geographical unit that includes the main island of Puerto Rico, Vieques, Culebra, the

USVI (excluding St. Croix) and the island of Anegada), has no germination problems, develops as reproductive individuals in a relatively short time period (1 to 2 years under nursery conditions), and is the subject of propagation and conservation protocols in development by the staff of the Royal Botanical Garden (KEW). Therefore, the Service considers that *V. rupicola* is a species with a high recovery potential that meets the definition of a threatened species. We find that an endangered species status is not appropriate for *V. rupicola* because the species is not currently in an imminent danger of extinction, but likely will be in the future as the scope and severity of threats become greater, placing the species in danger of extinction in the foreseeable future. Therefore, on the basis of the best available scientific and commercial information, we list *Varronia rupicola* as threatened in accordance with sections 3(20) and 4(a)(1) of the Act.

The threats to the survival of the species occur throughout the species' range and are not restricted to any particular significant portion of that range. Accordingly, our assessment and determination applies to the species throughout its entire range.

Available Conservation Measures

Conservation measures provided to species listed as endangered or threatened under the Act include recognition, recovery actions, requirements for Federal protection, and prohibitions against certain practices. The Act encourages cooperation with the States and requires that recovery actions be carried out for all listed species. The

protection required by Federal agencies and the prohibitions against certain activities are discussed, in part, below.

The primary purpose of the Act is the conservation of endangered and threatened species and the ecosystems upon which they depend. The ultimate goal of such conservation efforts is the recovery of these listed species, so that they no longer need the protective measures of the Act. Subsection 4(f) of the Act requires the Service to develop and implement recovery plans for the conservation of endangered and threatened species. The recovery planning process involves the identification of actions that are necessary to halt or reverse the species' decline by addressing the threats to its survival and recovery. The goal of this process is to restore listed species to a point where they are secure, self-sustaining, and functioning components of their ecosystems.

Recovery planning includes the development of a recovery outline shortly after a species is listed and preparation of a draft and final recovery plan. The recovery outline guides the immediate implementation of urgent recovery actions and describes the process to be used to develop a recovery plan. Revisions of the plan may be done to address continuing or new threats to the species, as new substantive information becomes available. The recovery plan identifies site-specific management actions that set a trigger for review of the five factors that control whether a species remains endangered or may be downlisted or delisted, and methods for monitoring recovery progress. Recovery plans also establish a framework for agencies to coordinate their recovery efforts and provide estimates of the cost of implementing recovery tasks. Recovery teams

(composed of species experts, Federal and State agencies, nongovernmental organizations, and stakeholders) are often established to develop recovery plans. When completed, the recovery outline, draft recovery plan, and the final recovery plan will be available on our website (<http://www.fws.gov/endangered>), or from our Caribbean Ecological Services Field Office (see **FOR FURTHER INFORMATION CONTACT**).

Implementation of recovery actions generally requires the participation of a broad range of partners, including other Federal agencies, States, Tribes, nongovernmental organizations, businesses, and private landowners. Examples of recovery actions include habitat restoration (e.g., restoration of native vegetation), research, captive propagation and reintroduction, and outreach and education. The recovery of many listed species cannot be accomplished solely on Federal lands because their range may occur primarily or solely on non-Federal lands. To achieve recovery of these species requires cooperative conservation efforts on private, State, and Tribal lands.

Following the effective date of this final listing rule (see **DATES**), funding for recovery actions will be available from a variety of sources, including Federal budgets, State programs, and cost share grants for non-Federal landowners, the academic community, and nongovernmental organizations. In addition, pursuant to section 6 of the Act, the Territory of the U.S. Virgin Islands and the Commonwealth of Puerto Rico would be eligible for Federal funds to implement management actions that promote the protection or recovery of *Agave eggersiana*, *Gonocalyx concolor*, and *Varronia rupicola*.

Information on our grant programs that are available to aid species recovery can be found at: <http://www.fws.gov/grants>.

Please let us know if you are interested in participating in recovery efforts for *Agave eggersiana*, *Gonocalyx concolor*, and *Varronia rupicola*. Additionally, we invite you to submit any new information on any of these species whenever it becomes available and any information you may have for recovery planning purposes (see **FOR FURTHER INFORMATION CONTACT**).

Section 7(a) of the Act requires Federal agencies to evaluate their actions with respect to any species that is listed as an endangered or threatened species and with respect to its critical habitat, if any is designated. Regulations implementing this interagency cooperation provision of the Act are codified at 50 CFR part 402. Section 7(a)(4) of the Act requires Federal agencies to confer with the Service on any action that is likely to jeopardize the continued existence of a listed species or result in destruction or adverse modification of critical habitat. If a species is listed subsequently, section 7(a)(2) of the Act requires Federal agencies to ensure that activities they authorize, fund, or carry out are not likely to jeopardize the continued existence of the species or destroy or adversely modify its critical habitat. If a Federal action may affect a listed species or its critical habitat, the responsible Federal agency must enter into consultation with the Service.

Federal agency actions within the species' habitat that may require conference or consultation or both as described in the preceding paragraph include management and any other landscape-altering activities on Federal lands administered by the U.S. Fish and Wildlife Service, U.S. Forest Service, and National Park Service (Salt River Bay National Historical Park and Ecological Preserve and Buck Island Reef National Monument); issuance of section 404 Clean Water Act permits by the U.S. Army Corps of Engineers; construction and maintenance of roads or highways by the Federal Highway Administration; and the issuance of permits for the installation of new telecommunication towers, expansion of existing ones, and their operation by the Federal Communication Commission.

The Act and its implementing regulations set forth a series of general prohibitions and exceptions that apply to all endangered and threatened plants. The prohibitions of section 9(a)(2) of the Act, codified at 50 CFR 17.61 for endangered plants and at 50 CFR 17.71 for threatened plants, in part, make it illegal for any person subject to the jurisdiction of the United States to import, export, transport in interstate commerce in the course of commercial activity, sell or offer for sale in interstate or foreign commerce, or remove and reduce the species to possession from areas under Federal jurisdiction. In addition, for plants listed as endangered, the Act prohibits the malicious damage or destruction on areas under Federal jurisdiction and the removal, cutting, digging up, or damaging or destroying of such plants in knowing violation of any State law or regulation, including State criminal trespass law. It is also unlawful to violate any

regulation pertaining to plant species listed as endangered or threatened (section 9(a)(2)(E) of the Act).

We may issue permits to carry out otherwise prohibited activities involving endangered and threatened plants species under certain circumstances. Regulations governing permits are codified at 50 CFR 17.62 for endangered plants, and at 17.72 for threatened plants. With regard to endangered and threatened plants, a permit issued under this section must be for one of the following: scientific purposes, the enhancement of the propagation or survival of threatened species, economic hardship, botanical or horticultural exhibition, educational purposes, or other activities consistent with the purposes and policy of the Act.

It is our policy, as published in the **Federal Register** on July 1, 1994 (59 FR 34272), to identify to the maximum extent practicable at the time a species is listed, those activities that would or would not constitute a violation of section 9 of the Act. The intent of this policy is to increase public awareness of the effect of a listing and ongoing activities within the range of listed species. The following activities could potentially result in a violation of section 9 of the Act; this list is not comprehensive:

(1) Unauthorized collecting, handling, possessing, selling, delivering, carrying, or transporting of *Agave eggersiana*, *Gonocalyx concolor*, or *Varronia rupicola*, including import or export across State lines and international boundaries without authorization.

(2) Removal, cutting, digging up, or damaging or destroying any of the species on any other area in knowing violation of any law or regulation of the Territory of U.S.

Virgin Islands or the Commonwealth of Puerto Rico or in the course of any violation of the Territory of U.S. Virgin Islands or the Commonwealth of Puerto Rico criminal trespass law.

(3) Introduction of unauthorized nonnative species that compete with or prey upon *Agave eggersiana*, such as the introduction of the nonnative agave snout weevil to the island of St. Croix, USVI.

(4) The unauthorized release of biological control agents that attack any life stage of *Agave eggersiana*, *Gonocalyx concolor*, or *Varronia rupicola*.

(5) Modifying the habitat of *A. eggersiana*, *G. concolor* and *V. rupicola* on Federal lands without authorization or coverage under the Act for impacts to these species.

Questions regarding whether specific activities would constitute a violation of section 9 of the Act should be directed to the Caribbean Ecological Services Field Office (see **FOR FURTHER INFORMATION CONTACT**).

Under section 4(d) of the Act, the Secretary has discretion to issue such regulations as he deems necessary and advisable to provide for the conservation of threatened species. Our implementing regulations (50 CFR 17.61 and 17.71) for endangered and threatened plants generally incorporate the prohibitions of section 9 of the Act for endangered plants, except when a rule promulgated pursuant to section 4(d) of the Act (4(d) rule) has been issued with respect to a particular threatened species. In such a case, the general prohibitions in 50 CFR 17.61 and 17.71 would not apply to that

species, and instead, the 4(d) rule would define the specific take prohibitions and exceptions that would apply for that particular threatened species, which we consider necessary and advisable to conserve the species. With respect to a threatened plant, the Secretary of the Interior also has the discretion to prohibit by regulation any act prohibited by section 9(a)(2) of the Act. Exercising this discretion, which has been delegated to the Service by the Secretary, the Service has developed general prohibitions that are appropriate for most threatened species in 50 CFR 17.71 and exceptions to those prohibitions in 50 CFR 17.72. We are not promulgating a 4(d) rule for *Varronia rupicola*, and as a result, all of the section 9(a)(2) general prohibitions, including the “take” prohibitions, will apply to *Varronia rupicola*.

Required Determinations

National Environmental Policy Act (42 U.S.C. 4321 et seq.)

We have determined that environmental assessments and environmental impact statements, as defined under the authority of the National Environmental Policy Act, need not be prepared in connection with listing a species as an endangered or threatened species under the Endangered Species Act. We published a notice outlining our reasons for this determination in the **Federal Register** on October 25, 1983 (48 FR 49244).

Government-to-Government Relationship with Tribes

In accordance with the President's memorandum of April 29, 1994 (Government-to-Government Relations with Native American Tribal Governments; 59 FR 22951), Executive Order 13175 (Consultation and Coordination With Indian Tribal Governments), and the Department of the Interior's manual at 512 DM 2, we readily acknowledge our responsibility to communicate meaningfully with recognized Federal Tribes on a government-to-government basis. In accordance with Secretarial Order 3206 of June 5, 1997 (American Indian Tribal Rights, Federal-Tribal Trust Responsibilities, and the Endangered Species Act), we readily acknowledge our responsibilities to work directly with tribes in developing programs for healthy ecosystems, to acknowledge that tribal lands are not subject to the same controls as Federal public lands, to remain sensitive to Indian culture, and to make information available to tribes. No tribal lands occur in Puerto Rico or the United States Virgin Islands.

References Cited

A complete list of references cited in this rulemaking is available on the Internet at <http://www.regulations.gov> under Docket No. FWS-R4-ES-2013-0103 and upon request from the Caribbean Ecological Services Field Office (see **FOR FURTHER INFORMATION CONTACT**).

Authors

The primary authors of this final rule are the staff members of the Caribbean Ecological Services Field Office.

List of Subjects in 50 CFR Part 17

Endangered and threatened species, Exports, Imports, Reporting and recordkeeping requirements, Transportation.

Regulation Promulgation

Accordingly, we amend part 17, subchapter B of chapter I, title 50 of the Code of Federal Regulations, as follows:

PART 17—[AMENDED]

1. The authority citation for part 17 continues to read as follows:

Authority: 16 U.S.C. 1361-1407; 1531-1544; and 4201-4245, unless otherwise noted.

2. Amend §17.12(h) by adding entries for “*Agave eggersiana*”, “*Gonocalyx concolor*”, and “*Varronia rupicola*” in alphabetical order under FLOWERING PLANTS to the List of Endangered and Threatened Plants, to read as follows:

§ 17.12 Endangered and threatened plants.

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(h) * * *

Species		Historic range	Family	Status	When listed	Critical habitat	Special rules
Scientific name	Common name						

FLOWERING PLANTS

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<i>Agave eggersiana</i>	No common name	St. Croix, USVI	Agavaceae	E	848	17.96(a)	NA
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<i>Gonocalyx concolor</i>	No common name	Puerto Rico	Ericaceae	E	848	17.96(a)	NA
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<i>Varronia rupicola</i>	No common name	Puerto Rico	Boraginaceae	T	848	17.96(a)	NA
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Dated: August 26, 2014

Signed: Rowan W. Gould

Acting Director, U.S. Fish and Wildlife Service

Billing Code 4310-55-P

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